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RC3000E Configuration Guide

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http://www.raisecom.com/en/xcontactus/contactus.htm.

If you have comments on the RC3000E specification, instead of the web page above, please send comments to:

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We hope to hear from you!

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Preface

About This Manual

This manual introduces primary functions of the configuration management software for RC series products. This manual is applicable for configuring software of RC3000E.

Who Should Read This Manual

This manual is a valuable reference for sales and marketing staff, after service staff and telecommunication network designers. For those who want to have an overview of the features, applications, structure and specifications of RC3000E devices, this is also a recommended document.

Relevant Manuals

RC3000E Commands Notebook

Organization

Chapter 1 System Overview

Introducing function features of RC3000E device systematically.

Chapter 2 How to Use the Command Line

This chapter introduces the using features and basic methods of configuring RC3000E device by command line.

Chapter 3 System Configuration

This chapter introduces the basic function and configuration of system commands of RC3000E device.

Chapter 4 Clock Source Configuration

This chapter introduces the configuration of RC3000E clock source.

Chapter 5 Network Protocol Configuration

This chapter introduces the network protocol function and its configuration methods.

Chapter 6 Cross Connect Configuration

Introduces cross connection configuration in RC3000E.

Chapter 7 Uplink Card Protection Switch Configuration

Introduces uplink card protection switch configuration in RC3000E.

Chapter 8 Typical Application of Network Management Configuration

This chapter introduces typical application of RC3000E network management configuration.

Compliance

The RC series products developed by Raisecom are strictly complied with the following standards as well as ITU-T, IEEE, IETF and related standards from other international telecommunication standard organizations:

YD/T900-1997 SDH Equipment Technical Requirements - Clock

YD/T973-1998 SDH 155Mb/s and 622Mb/s Technical conditions of optical transmitter module and receiver module

YD/T1017-1999 Network node interface for the Synchronous Digital Hierarchy (SDH)

YD/T1022-1999 Requirement of synchronous digital hierarchy (SDH) equipment function

YD/T1078-2000 SDH Transmission Network Technique Requirements-Interworking of Network Protection Architectures

YD/T1111.1-2001 Technical Requirements of SDH Optical Transmitter/Optical Receiver Modules——2.488320 Gb/s Optical Receiver Modules

YD/T1111.2- 2001 Technical Requirements of SHD Optical Transmitter/Optical Receiver Modules——2.488320 Gb/s Optical Transmitter Modules

YD/T1179- 2002 Technical Specification of Ethernet over SDH

G.703 Physical/electrical characteristics of hierarchical digital interfaces

G.704 Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels

G.707 Network node interface for the synchronous digital hierarchy (SDH)

G.774 Synchronous digital hierarchy (SDH) - Management information model for the network element view

G.781 Synchronization layer functions

G.783 Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks

G.784 Synchronous digital hierarchy (SDH) management

G.803 Architecture of transport networks based on the synchronous digital hierarchy (SDH)

G.813 Timing characteristics of SDH equipment slave clocks (SEC)

G.823 The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy

G.825 The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy (SDH)

G.826 End-to-end error performance parameters and objectives for international, constant bit-rate digital paths and connections

G.828 Error performance parameters and objectives for international, constant bit-rate synchronous digital paths

G.829 Error performance events for SDH multiplex and regenerator sections

G.831 Management capabilities of transport networks based on the synchronous digital hierarchy

(SDH)

G.841 Types and characteristics of SDH network protection architectures

G.842 Interworking of SDH network protection architectures

G.957 Optical interfaces for equipments and systems relating to the synchronous digital hierarchy

G.691 Optical interfaces for single channel STM-64 and other SDH systems with optical amplifiers

G.664 Optical safety procedures and requirements for optical transport systems

I.731 ATM Types and general characteristics of ATM equipment

I.732 ATM Functional characteristics of ATM equipment

IEEE 802.1Q Virtual Local Area Networks (LANs)

IEEE 802.1p Traffic Class Expediting and Dynamic Multicast Filtering

IEEE 802.3 CSMA/CD Access Method and Physical Layer Instruction

Chapter 1 System Overview

RC3000 is a multi-service multiplexing device that in support of cross connecting 16 lines of E1 at random. TDM signal of different service cards realizes DXC matrix switchover via main board. Meanwhile, RC3000E is in support of access multi-service to transmission line, including Ethernet data, V5 card, V24 data, asynchronous serial communication data, voice FXO, voice FXS, voice E&M, etc.

Decentralization management is been adopted by RC3000E. The main cards including network management function, cross-connect function and clock function, etc. shorted as DXC card. Slot 4 is for uplink card, providing E1 protection switch. According to the different single card type, the DXC card and other service card exchange switch information with remote modules via backboard. The DXC card provides CONSOLE, TELNET, SNMP network management interfaces which provide unified network management and comprehensive deployment to nodes, remote and ring network devices.

The slots and sub-cards location of RC3000E sees as below figure:

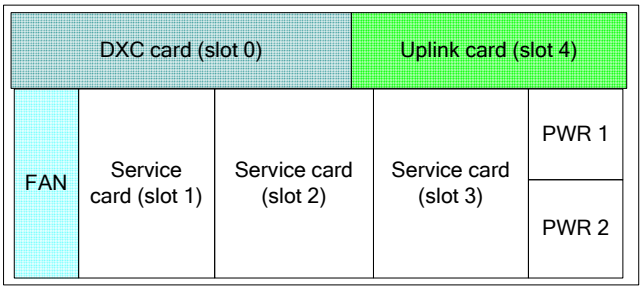


Figure 1-1 RC3000E sub-card distribution

DXC card is fixed on main card (slot 0), uplink card is fixed to be located at slot 4, service card 1~3 can be any service card, the fan, power supply 1 and power supply 2 are all fixed.

1.1 Procedure of device startup

Plug service cards and power supply cards in correct slots and connect service cable properly, then the device can start working after electrifying.

There are two methods for users to access device by PC: one is access by network management software (connected by SNMP interface); the other one is access by hyperterminal (connected by SNMP or CONSOLE interface).

Basic way of hyperterminal command line will be introduced in chapter 2 of this document. All configuration applications provided by this document are processed on hyperterminal.

The network management software should be configured correctly via hyperterminal before using. Please see chapter 8 for details.

Clock source configuration of DXC card and will be finished by system automatically; on the other hand, users can assign operation by manual. Please see chapter 4 for details.

The chapter 8 brings users forth to manage remote device. To finish e1 protection switch by RC3000E uplink card please refer to chapter 7.

Note: Configuration of service card can be stored in cross card. So when plugging single card into a slot of the same type service card, the DXC card will restore its configuration by automation.

Chapter 2 How to Use The Commands Line

2.1 Software and hardware environment

Hardware environment: RC3000E device platform

PC serial interface

Software environment: WIN98/WIN2000/WINDOWS XP

2.2 Getting helps

Commands	Function description
help	Getting a brief description from help system.
list	List out the commands under specified mode.
abbreviated-command-entry ?	Obtaining a list of commands that begins with a given string (*abbreviated-command-entry*). For example: Raisecom#**en** ? **english** **enable**
?	Listing all the commands in specified mode. For example: Raisecom#?
command ?	Listing all the key words, options and brief help information of a command. Raisecom#**show** ?
abbreviated-command-entry<*Tab*>	Supplementing an unfinished command. For example: Raisecom#**show** cpu <*TAB*> Raisecom#**show cpu-utilization-ratio**

2.3 How to use history command

There are 20 history commands stored in the memory of the device system by default. User can configure the number of history commands that system can save by the command:

Raisecom> **terminal history** <*1-20*>

Use **history** to show commands that has been input.

2.4 How to use edit properties

- up arrow: last command
- down arrow: next command
- left arrow: move a character left

- right arrow: move a character right
- <Backspace>: delete a character in front of the cursor
- <Ctrl>+y: show historical commands
- <Ctrl>+l: clear the screen
- <Ctrl>+u: show the using condition of the memory
- <Ctrl>+z: return to the privileged EXEC mode from any other modes

2.5 Commands line modes

Mode	Mode description	Access	Identifier
User EXEC	Users are authorized to configure basic information and display parameters, etc. of terminal.	Log onto the device and input user name and password.	Raisecom>
Privileged EXEC	Users are authorized to configure basic information, such as system time, and display parameters. Unauthorized to configure running information.	Using command **enable** under user EXEC mode.	Raisecom#
Global configuration	Users are authorized to configure all running parameters.	Using command **config** under Privileged EXEC mode.	Raisecom (config)#
Slot configuration	Users are authorized to configure all running parameters of service card in slot.	Using command **slot** under global configuration mode.	Raisecom (config-slot/PATH)# PATH: slot path
Remote configuration	Users are authorized to configure all running parameters of remote devices.	Using command **remote** under global configuration mode.	Raisecom (config-remote/PATH)# PATH: remote device path
Interface configuration	Users are authorized to configure parameters of local Ethernet network management interface, SDH interface, local and remote E1 interface, and PDH interface.	Using command **interface** under global configuration mode, slot configuration mode or remote configuration mode.	Raisecom (config-TYPE/PATH)# TYPE: interface type like pdh, stm, e1, etc. PATH: interface path

Note: Device Path Definition:

Slot path: “/n”, where n indicates slot number;

Remote device path: “/n/a/b…”, where n indicates slot number, a indicates first layer remote device number; b indicates second layer remote device number. RC3000E is able to bear four layers of remote devices at most.

Interface path: local interface path is denoted as “slot path/ interface number”; remote interface path is denoted as “remote device path/ interface number”.

Chapter 3 System Configuration

3.1 Basic system commands and configuration

3.1.1 Basic operation

chinese	show command help information in Chinese
english	show command help information in English
clear	clear showing information on the screen
list	show all command list under specified mode
quit	quit from logon
exit	return to previous mode
end	return to privileged mode, same as <Ctrl+z>

3.1.2 Showing and configuring of basic system information

- Common operations under user EXEC mode:
  terminal line set terminal line, no format can restore default value;
  terminal time-out set terminal time-out maximal value;
  terminal history set recorded history commands.

- Common operations under privileged EXEC mode:
  reboot reboot device;
  logout logout from current logging, the command **quit** and **exit** can also logout;
  hostname change system name, no format command can restore default name;
  show cpu-utilization-ratio show utilization ratio of CPU;
  show general alarm show general alarm information.

- Basic information configuration under global configuration mode:
  show device-info show information of device shelf;
  device assetid set device asset ID;
  device description set description information of device;
  device shelf assetid set asset ID of device shelf.

- Common operations under global configuration mode and privileged EXEC mode:
  device lock lock out device, not allowed to enter global configuration mode (only global configuration mode);
  device unlock unlock device, allowed to enter global configuration mode (only global configuration mode);
  show clock show system time;
  clock set change system time;
  show slot show list of local cards;
  show device show list of remote device.

Example: Logon system (use username raisecom), show time and basic information of device, logout:

Login: raisecom

Password:

Raisecom> **enable**

Password:

Raisecom# **config**

Configuration mode, one conmmand input per time. End with CTRL-Z.

Raisecom(config)# **show clock**

Current system time: 01/01/1970 08:14:48 +08:00

Raisecom(config)#

Raisecom(config)# **show device-info**

Name : RC3000E

Description: RC3000E-Raisecom

Serial no :

Asset ID :

Device temperature alarm threshold: 50

Power info

Power 1 normal

Power 2 not exist or abnormal

Fan info

Fan 1 not exist or abnormal

Fan 2 not exist or abnormal

Snmp interface info

Link Status :down

Duplex :half-duplex

Speed :10baseT

Autonegotiation :enable

Raisecom(config)# **show slot**

slot 0: working , rc3000E , local , none , poll ,

slot 1: working ,rc3000-sub-10fxso ,rs-232 , none , poll ,

slot 2: null ,

slot 3: null ,

slot 4: null ,

2 board(s) in slot(s)

Raisecom(config)# **show device**

0 device(s) found

Raisecom(config)#

Raisecom(config)# **exit**

Raisecom# **logout**

Login:

Note: The logon password won't show in the screen.

3.2 Management of configuring file and startup file

3.2.1 Configure startup file

- Startup file to configure is named: **startup-config.conf** by default;
- Use the command **write** can write the startup file into **flash** file system, when reboot system next time, the store files will be configured again;
- Use the command **erase startup-config** can delete file;
- Startup file named **startup-config.conf** can be uploaded to TFTP or FTP server by the command **upload** or be downloaded to the system to replace the primary files by the command **download**;
- Use the command **show startup-config** to show configuration information of startup files;
- Use the command **show running-config** to show configuration information of current system;
- Use the command **show this** to show current system configuration information of current command node.

3.2.2 Host file

The host file belongs to host software, the file name begins with RC3000E and the current system program file is named rc3kenms.z;

Program file can be downloaded to host software of system by TFTP or FTP protocol; use the command **show version** to view the software version.

3.2.3 Update host software from bootrom

Two methods can be chosen to update host software from bootrom, one is to update from serial port by Xmodem protocol, the other one is to update from network by FTP protocol. Operations as below steps:

1) Users who has administrator right logs in Privileged EXEC mode by serial port;

2) Input command **reboot**;

3) Press **<Space>** key to enter **[raisecom]** interface, show below information:

? show this list

h show this list

i modify network manage port ip address

s show network manage interface information

d delete core file

u update your system

m *update microcode*

r *reboot system*

test *test the hardware*

4) Input *u* to update system, the interface shows as below:

choose mode for updating core file.

```
---------------------------------
-       1.    |     serial      -
---------------------------------
-       2.    |     network     -
---------------------------------
```

please input choose the mode...

5) Input *1* to choose serial interface for downloading:

choose serial baud rate for updating core file.

```
---------------------------------
-       1.    |     9600        -
---------------------------------
-       2.    |     14400       -
---------------------------------
-       3.    |     19200       -
---------------------------------
-       4.    |     38400       -
---------------------------------
```

please input choose the baud rate...

6) After entering baud rate, the system is waiting to transmit upgrade file through the serial port, now press **[Transfer]** as below figure shows:

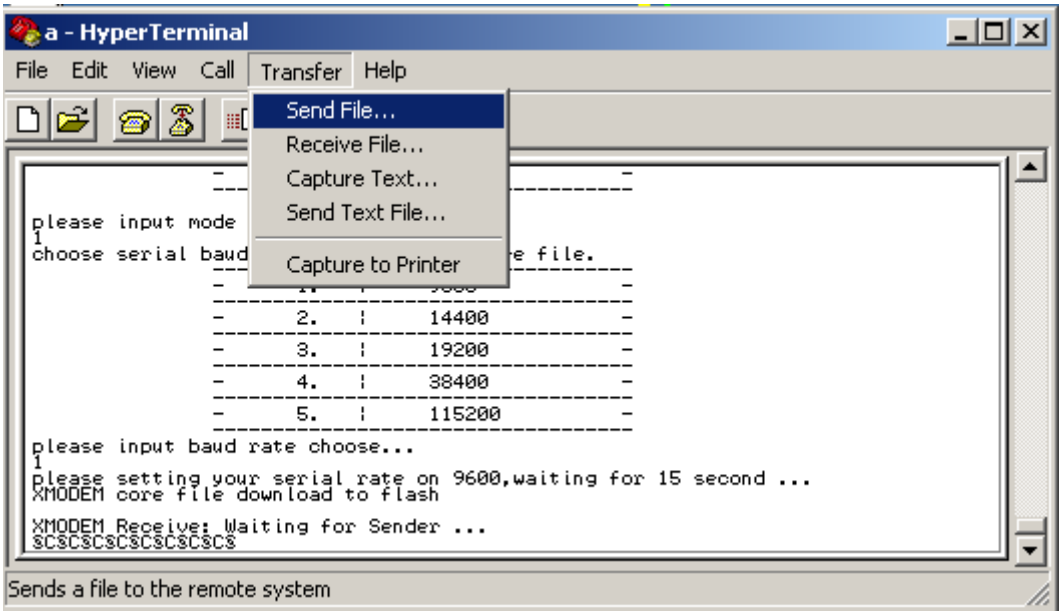

a - HyperTerminal
File Edit View Call Transfer Help
Send File...
Receive File...
Capture Text...
Send Text File...
Capture to Printer
please input mode
1
choose serial baud
e file.
-       2. | 14400   -
-       3. | 19200   -
-       4. | 38400   -
-       5. | 115200   -
please input baud rate choose...
1
please setting your serial rate on 9600,waiting for 15 second ...
XMODEM core file download to flash
XMODEM Receive: Waiting for Sender ...
CCCCCCCCC
Sends a file to the remote system

Figure 3-1

Choose the file to transmit:

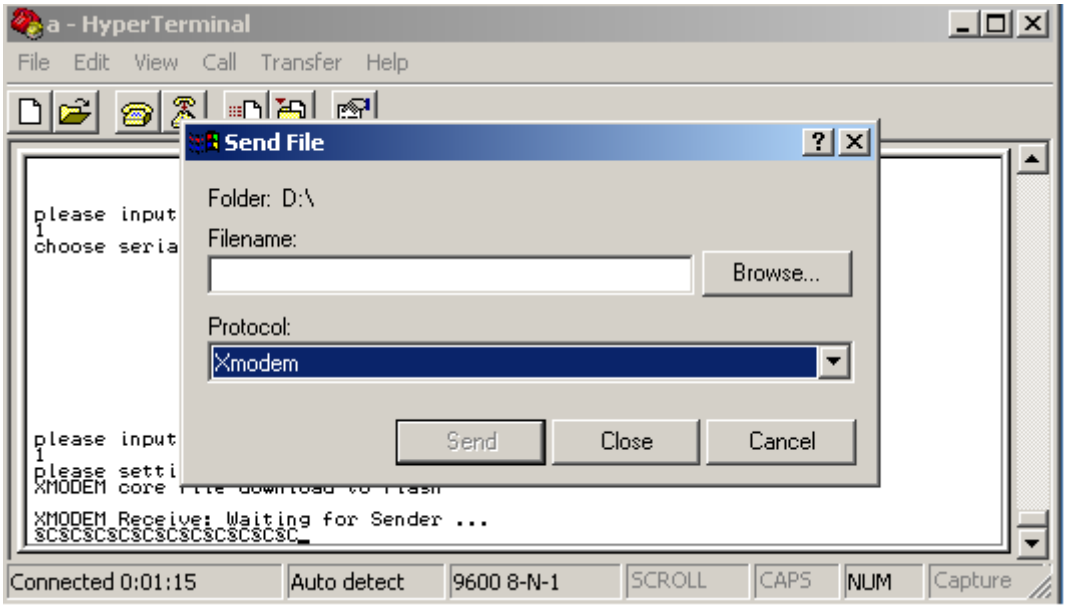


Figure 3-2

Press <**Browse**> to choose the program file to be downloaded, press <**Send**> then shows the below interface:

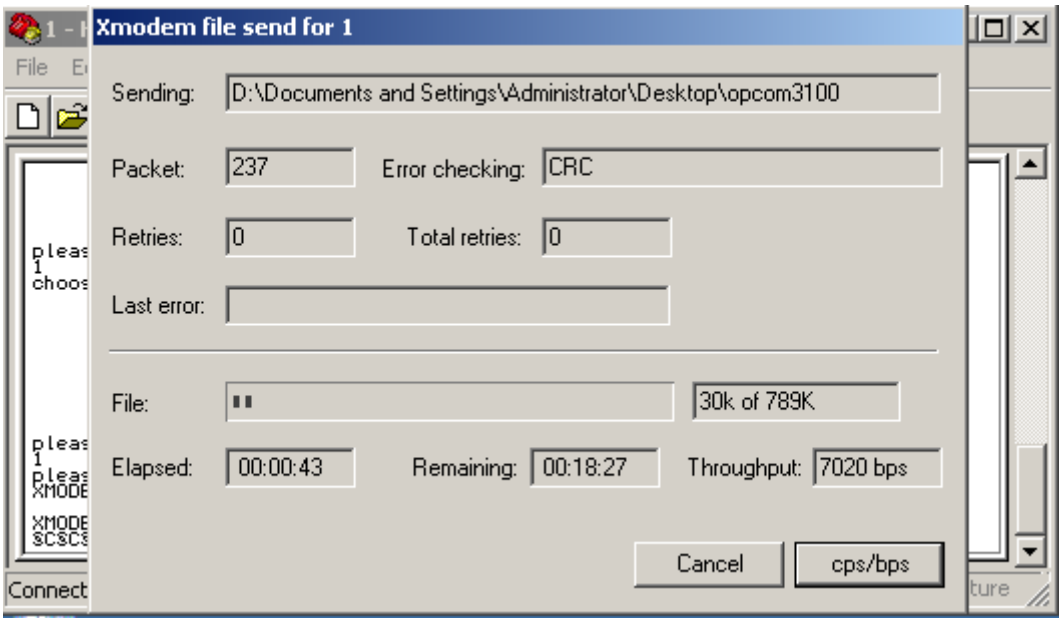


Figure 3-3

After downloading there will be the command-line:

Do you want to update core code? <Y/N>y

Choose **y** to finish the program upgrading.

Upgrade the program file through network via FTP protocol:

1) The user with administrator privilege can login and enter the privileged EXEC mode through the serial port;

2) Enter the command **reboot**;

3) Press **<Space>** key to enter the **[raisecom]** interface, enter "**?**" to show the command list.

```
?       show this list
h       show this list
i       modify network manage port ip address
s       show network management interface information
d       delete core file
u       update your system
m       update microcode
r       reboot system
test    test the hardware
```

4) Enter "*u*" to upgrade program file, the interface is as follows:

```
choose mode for updating core file.

  -------------------------------------
- 1.  |  serial              -
  -------------------------------------
- 2.  |  network             -
  -------------------------------------

please input mode choose...
```

5) Enter "*2*" to choose network for downloading, the interface is as follows:

```
starting config network infor ...
    host ip address:  192.168.2.225
  filename:  rc3k15nms.z
  usr:  wrs
passwd:  wrs
```

Input host IP address, file name, user name and password of FTP in turn, and then get into the interface as follows:

```
Start to connect host, please wait...
```

Now the program upgrade has been finished.

Note: 1. Host IP address should in one network segment with network management IP address when downloading (input "s" at step 3) for checking);

2. Users need to reboot device again after updating.

3.2.4 Update host software in Privileged EXEC mode

Users can download host software directly under Privileged EXEC mode.

1) The user with administrator privilege can login and enter the privileged EXEC mode through the serial port;

2) Input **download system-boot ftp** to update host software through FTP protocol;

3) Below interface shows after executing the command:

Please input server IP Address : 192.168.4.28

Please input FTP User name : wrs

Please input FTP Password : wrs

Please input FTP Server File Name : rc3kenms.z

Input host IP address, file name, user name and password of FTP in turn, and then get into the interface as follows:

Are you sure[Y/N]:y

Input *y* to confirm the operation is correct, then shows the below interface:

Loading, please wait...file length = 1884532

Please select the disk for saving image

1. core:

2. exit

Please input the number: 1

Input *1* to choose updating program:

Writing to core disk, please wait...

Copy file successfully!

Please reboot device!

Now the program upgrade from FTP has finished.

Note:

- Host IP address should in one network segment with SNMP interface IP address when downloading;
- Users need to reboot device again after updating.

3.2.5 Update software of service card from network management card

At present, only optical interface uplink card is in support of this function.

1) The user with administrator privilege can login and enter the privileged EXEC mode through the serial port;

2) Input **download svcfile system-boot ftp** to update host software through FTP protocol;

3) Below interface shows after executing the command:

Please input location of service board : slot 4

Please input server IP Address : 192.168.4.34

Please input FTP User name : wrs

Please input FTP Password : wrs

Please input FTP Server File Name : xxxx.z

Input service card slot ID, host IP address, file name, user name and password of FTP in turn, and then get into the interface as follows:

Are you sure[Y/N]:y

Input *y* to confirm the operation is correct, then shows the below interface:

Loading file from server to ram, please wait...

File length = 708777

Transmitting file to service board, transmitted 100%

Writing file to flash of service board, please wait...

Write flash about 60s, current waiting 22s

Finished.

Copy file successfully!

Now the single card program upgrade from FTP via network management card has finished.

3.3 User management

Commands	Description
user *USERNAME* **password** *（no-encryption|md5）PASSWORD*	Add username and set password. *USERNAME*: user name; *(no-encryption|md5}*: encryption item. no-encryption, no-encryption; md5, md5, arithmetic encryption password; *PASSWORD*: password
user *USERNAME* **privilege** *(administrant|normal|limited)*	Set user privilege *USERNAME*: user name; *(administrant|normal|limited)*: user privilege level. *administrant*, system administrator; *normal*, normal user; *limited*, limited user.
write	Save user configuration information
save user	Save the added user information
show user	Show the user information
show terminal	Show current terminal user information

Table 3-1 User Management Commands Table

ⓘ**Note:** System default user name: raisecom, pin code: raisecom.

Example: Add a normal user named rc3ke, pin code: rc3ke, no-encrtyption the password, normal privilege:

Raisecom# **user** *rc3ke* **password** *no-encryption rc3ke*

Set successfully !

please execute "write" to save!

Raisecom# **user** *rc3ke* **privilege** *normal*

Set successfully !

please execute "write" to save!

Chapter 4 Clock Source Configuration

4.1 Overview

RC3000E system clock includes master mode and slave mode. Master mode clock source is internal crystal run; slave mode clock can choose uplink card E1 line sample clock. Default is slave mode uplink E1-1 line sample clock.

Subscriber can assign at most 4 clock sources for selection and set their priority. Selection of clock source has auto-switch mode and manual-switch mode, default to be auto-switch.

Under auto-switch mode, clock module can set as return or non-return mode. In return mode, it always switches to the highest available clock source of current priority, the clock restore time can be set; in non-return mode, only if the current clock source is not local clock and loss of source, it can switch to highest priority available clock source.

Under auto-switch mode, clock module judges whether switch back to highest available source of current priority according to clock source status and setting priority as well as clock return mode; the clock switches to internal crystal running if there is no available clock source currently.

Under manual switch mode, clock module switches clock to assigned clock source and don't make auto-switch action. If the user assigned source is invalid, clock will be switched to auto mode and choose clock source by auto-switch mode.

4.2 Configure application

Commands	Description
config	Enter global configuration mode
device clock mode *(master|slave)*	Configure clock mode. Default to be master mode. *master*: master clock mode; *slave*: slave clock mode.
device clock e1 *<1-8>* **priority** *<1-4>*	Configure clock priority under master mode; no format command can cancel priority. *1-8*: uplink card E1 interface ID; *1-4*: priority
device clock restore *(enable|disable)*	Set clock restore mode under auto-mode. *enable*: restore clock to high priority; *disable*: the clock works at current clock.
device clock wait-to-restore-time *<0-12>*	Wait to restore time under clock auto-mode. *<0-12>*: clock restore time, unit: minute.
device clock manual-switch e1 *<1-8>*	Force switch clock source under slave mode. *1-8*: uplink card E1 interface ID.
no device clock manual-switch	Cancel force switch and restore auto-switch mode.
show device clock	Show device clock information.

Note: E1 link sample clock may have alarm; users can view configuration priority by the command of **show device clock**. Some certain single card is not provided with backboard line sample clock, users can view if setting is valid by command **show device clock** after configuring priority.

Example: configure clock mode to be slave mode, configure priority (auto-switch to available highest level clock after assigning priority), force switch to line sample clock of E1-1 (E1-1 clock is abnormal, restore to default configuration), at last, cancel force setting:

Raisecom# **config**

Configuration mode, one conmmand input per time. End with CTRL-Z.

Raisecom(config)# **show device clock**

mib status information as follows :
clock mode status: master
clock mode config: master
clock restore: enable
clock wait to restore time: 1 minutes
current clock source : local
current clock alarm : normal
switch status : auto
mannul switch : auto switch

clk-src	pri	wtr-left(sec)	status	alarm
not used	1	0	normal	
not used	2	0	normal	
not used	3	0	normal	
not used	4	0	normal	

Raisecom(config)# **device clock mode** *slave*

mib status information as follows :
clock mode status: slave
clock mode config: slave
clock restore: enable
clock wait to restore time: 1 minutes
current clock source : local
current clock alarm : normal
switch status : auto
mannul switch : auto switch

clk-src	pri	wtr-left(sec)	status	alarm
not used	1	0	normal	
not used	2	0	normal	
not used	3	0	normal	
not used	4	0	normal	

Raisecom(config)# **device clock e1** *7* **priority** *1*

Set successfully

Raisecom(config)# **device clock e1** *6* **priority** *2*

Set successfully

Raisecom(config)# **device clock e1** *1* **priority** *4*

Set successfully

Raisecom(config)# **show device clock**

mib status information as follows :

clock mode status: slave

clock mode config: slave

clock restore: enable

clock wait to restore time: 1 minutes

current clock source : line e1 7

current clock alarm : normal

switch status : auto

mannul switch : auto switch

---

clk-src pri wtr-left(sec) status alarm

---

line e1 7 1 0 normal

line e1 6 2 0 normal

not used 3 0 normal

line e1 1 4 0 los

Raisecom(config)# **device clock manual-switch e1** *1*

Set successfully

Raisecom(config)# **show de clo**

mib status information as follows :

clock mode status: slave

clock mode config: slave

clock restore: enable

clock wait to restore time: 1 minutes

current clock source : line e1 7

current clock alarm : normal

switch status : auto

mannul switch : line e1 1

---

clk-src pri wtr-left(sec) status alarm

---

line e1 7 1 0 normal

line e1 6 2 0 normal

not used 3 0 normal

line e1 1 4 0 los

Raisecom(config)# **no device clock manual-switch**

Set successfully

Raisecom(config)# **show device clock**

mib status information as follows :

clock mode status: slave

clock mode config: slave

clock restore: enable

clock wait to restore time: 1 minutes

current clock source : line e1 7

current clock alarm : normal

switch status : auto

mannul switch : auto switch

---

clk-src pri wtr-left(sec) status alarm

---

line e1 7 1 0 normal

line e1 6 2 0 normal

not used 3 0 normal

line e1 1 4 0 normal

Raisecom(config)#

Chapter 5 Network Protocol Configuration

5.1 Mappings from IP address to physical address

Commands	Description
config	Enter the global configuration mode
arp add *A.B.C.D MACADDRESS*	Add a mapping from IP address to physical address. *A.B.C.D*: the IP address of the interface; *MACADDRESS*: <AA.BB.CC.DD.EE.FF>, the interface mapped physical interface MAC address.
arp delete *A.B.C.D*	Delete a mapping from IP address to physical address.
show arp	Show ARP table.

Table 5-1 ARP Commands Table

Example: Add a mapping from IP 192.168.2.11 to physical address 00:50:8d:46:fb:3

Raisecom# **config**

Configuration mode, one command input per times. End with CTRL-Z.

Raisecom(config)# **arp add** *192.168.2.11 00:50:8d:46:fb:3*

Successfully add an entry from ARP table

Raisecom(config)# **show arp**

LINK LEVEL ARP TABLE

destination mac-addr flags(0x)Rfc Use Interface

192.168.2.11 00:50:8d:46:fb:3 c05 0 0 hw0

5.2 Configure IP address of SNMP interface

Sometimes users need to change network management IP address, in this case, **IP Address** command can be used to modify IP address of network management.

Commands	Description
config	Enter the global configuration mode.
interface snmp	Enter snmp interface configuration mode.
show interface snmp	Show snmp interface configuration.
ip address *A.B.C.D [A.B.C.D]*	Configure network management IP address. *A.B.C.D*: IP address of network management, floating decimal format; *[A.B.C.D]*: sub-net mask of network management IP address, floating decimal format.

Table 5-2 SNMP Network Management IP Commands Table

Example: Configure IP of network management to be 192.168.2.20 and sub-net mask to be 255.255.255.0

Raisecom# **config**

Configuration mode, one command input per times. End with CTRL-Z.

Raisecom (config)#**interface snmp**

Raisecom (config-snmp)#**ip address** *192.168.2.20 255.255.255.0*

Raisecom (config-snmp)# **show interface snmp**

Interface:snmp Operation Status :up

Note: IP of network management should be in one network segment with host IP, that is to say, host IP in this example is also in network segment 2.

5.3 Configure SNMP COMMUNITY table

The host network management software can not manage device until configuring community. The following commands need to be configured:

Commands	Description
config	Enter global configuration mode.
snmp-server community *COMMUNITYNAME* [*RO* | *RW*]	Add a community. *COMMUNITYNAME*: community name; *RO*: read only; *RW*: ready and write.
no snmp-server community *COMMUNITYNAME*	Delete a community.
show snmp-server community	Show COMMUNITY table.

Table 5-3 Configure SNMP Community

Example:

Raisecom# **config**

Configuration mode, one command input per time. End with CTRL

Raisecom(config)# **snmp-server community** *public ro*

Set snmp community name successfully

Raisecom(config)# **snmp-server community** *private rw*

Set snmp community name successfully

Raisecom(config)# **show snmp-server community**

ID COMMUNITYNAME RIGHT

---

1 public ro

2 private rw

5.4 Configure SNMP trap-server host

The trap-server is responsible to receive TRAP, default pot is 162.

Commands	Description
config	Enter global configuration mode.
snmp trap-server *A.B.C.D* {*<1-65535>*}	Configure host to receive SNMP trap-server information. *A.B.C.D*: IP of trap-server, in format of floating decimal format; {*<1-65535>*}: port index of host trap-receiving.
no snmp trap-server *A.B.C.D*	Delete snmp trap-server.
show snmp trap-server	Show information of trap-server host.

Table 5-4 Configure SNMP Trap-server

Example: Add a trap-server with IP 192.168.1.16

Raisecom# **config**

Configuration mode, one command input per time. End with CTRL

Raisecom(config)# **snmp trap-server** *192.168.1.16*

Set trap server successfully

Raisecom(config)# **show snmp trap-server**

Trap server:

ADDRESS PORT

192.168.1.16 162

Chapter 6 Cross Connection Configuration

6.1 Overview

DXC card of RC3000E provides slot cross-connection, the service card marked by slot. The number of E1 occupation is decided by service card type, supporting bi-directional and uni-directional cross-connection.

6.2 Slot cross configuration

All slots cross in RC3000E are in allusion to service card E1 timeslot. User can not create cross-connection among any service card timeslots successfully unless the service card is plugged in slot.

- Any timeslots cross-connection among 16 paths of E1, 512x512 non-blocking switch network;
- Any timeslots bi-directional connection, broadcast connection and uni-directional connection. The uni-directional timeslots cross-connection is uni-directional service from source timeslot to destination timeslot, bi-directional timeslots cross-connection is bi-directional service between source timeslot and destination timeslot, broadcast is uni-directional cross-connection from one source timeslot to multiple destination timeslots.
- In support of 128 paths of E1 cross any timeslot, 4096x4096 unblocked switching network;
- Bi-directional connection, broadcast timeslot connection and uni-directional timeslot connection among any timeslots function is available. Uni-directional timeslot cross is uni-directional service from source timeslot to destination timeslot; bi-directional timeslot cross is bi-directional service between source timeslot and destination timeslot; broadcast is uni-directional cross connection from one source timeslot to multiple destination timeslots.

Detailed cross connection commands:

Commands	Description
config	Enter global configuration mode.
crossconnect source *SLOT/E1/TSSTRING* **sink** *SLOT/E1/TSSTRING [twoway]* Or **crossconnect sink** *SLOT/E1/TSSTRING* **source** *SLOT/E1/TSSTRING [twoway]*	Create slot cross connect. **source**: crossed source timeslots; **sink**: crossed destination timeslots; *SLOT/E1/TSSTRING*: SLOT: slot index, should not be slot number of NM cross-connection card; E1: logic E1 index of backboard STBUS, this number is different according to card type and slot location, the number value is in different range; TSSTRING: timeslot string in logic E1, value range is 0-31; *twoway*: bi-directional cross, default to be uni-directional cross.
no crossconnect sink *SLOT/E1/TSSTRING*	Delete uni-directional cross. *SLOT/E1/TSSTRING*: same as above.
no crossconnect slot *SLOTSTRING*	*SLOTSTRING*: slot index, in character string mode.
show crossconnect slot *SLOTSTRING*	Show all cross information at slot. *SLOTSTRING*: same as above.

Example:

Configure cross connection, cross connect from timeslot 0-31 of slot 4 e1 line 1 to timeslot 0-31 of slot 4 e1 line 2, bi-directional cross, delete one uni-directional cross from it and delete all cross connection at the slot:

Raisecom# **config**

Configuration mode, one conmmand input per time. End with CTRL-Z.

Raisecom(config)# **crossconnect** *source 4/1/0-31 sink 4/2/0-31 twoway*

Configure the crossconnect successfully.

Raisecom(config)# **show crossconnect slot** *4*

crossconnect source 4/2/0-31 sink 4/2/0-31

crossconnect source 4/1/0-31 sink 4/1/0-31

Raisecom(config)# **no crossconnect** *sink 4/1/0-31*

Set successfully

Raisecom(config)# **show crossconnect slot** *4*

crossconnect source 4/2/0-31 sink 4/1/0-31

Raisecom(config)# **no crossconnect slot** *4*

Set successfully

Raisecom(config)# **show crossconnect slot** *4*

no crossconnect exist

Raisecom(config)#

Note: A successful cross-connect configuration only guarantee data transmission. To realize service transmission, subscribers need make other relevant configurations according to single card features.

Chapter 7 Uplink Card Protection Switch Configuration

7.1 Overview

All uplink cards of RC3000E support E1 protect-switch. The protection pair number is different according to uplink cards.

At present uplink card supports at most 4 E1 protection pairs, E1-1 and E1-2, E1-3 and E1-4, E1-5 and E1-6, E1-7 and E1-8 are protection pairs respectively.

In support of auto, manual, protection lock and force command setting. The protection lock has the highest priority, priority of force command is lower.

Under auto-switch mode, there is return mode and non-return mode. Return mode can set switch time by software. The switching condition is E1 has LOS, LOF, AIS or software E3 alarm; E3 alarm can take part in switch protection via software setting, then it can set E3 alarm holding time.

Auto-operation: at the beginning, it works in master channel, and switch to standby channel immediately when the master channel has switch condition; if it is non-return mode, it works at this channel until the standby channel has alarm and master channel restore, if it is in return mode, it switch back to master channel after the restore time.

Manual-operation: can set it works at master or standby channel, it can switch to auto-operation when the set channel has APS alarm; it switches according to actual command when there are other higher priority operation.

Force operation: unconditional working in assigned channel, never switch if haven't cleared force or higher priority command.

Protection lock operation: unconditional working in work line, never switch until clearing protection lock.

Here just introduce protection switch configuration of uplink card. The other features of uplink card please refer to uplink card configuration guide.

7.2 Configure application

Commands	Description
config	Enter global configuration mode
slot	Enter slot configuration mode.
protect-switch *(enable|disable)* *(1/2|3/4|5/6|7/8)*	Create protection pair. *enable*: Create protection pair *disable*: Delete protection pair *1/2*: E1-1 and E1-2 protect each other *3/4*: E1-3 and E1-4 protect each other *5/6*: E1-5 and E1-6 protect each other *7/8*: E1-7 and E1-8 protect each other
aps-mode *(1/2|3/4|5/6|7/8)* *(revertive|nonrevertive)*	Setting auto-restore mode *1/2*: E1-1 and E1-2 protect each other

	3/4: E1-3 and E1-4 protect each other *5/6*: E1-5 and E1-6 protect each other *7/8*: E1-7 and E1-8 protect each other *revertive*: restore to work line mode *nonrevertive*: don't restore to work line
aps-restore-time *(1/2|3/4|5/6|7/8) <0-12>*	Setting auto-restore time. *1/2*: E1-1 and E1-2 protect each other *3/4*: E1-3 and E1-4 protect each other *5/6*: E1-5 and E1-6 protect each other *7/8*: E1-7 and E1-8 protect each other *<0-12>*: auto-restore time, unit: minute
force-switch *(1/2|3/4|5/6|7/8) (work-line|protection-line|clear)*	Setting force switch command *1/2*: E1-1 and E1-2 protect each other *3/4*: E1-3 and E1-4 protect each other *5/6*: E1-5 and E1-6 protect each other *7/8*: E1-7 and E1-8 protect each other *work-line*: force to work line *protection-line*: force to protection line *clear*: clear force switch
show aps	Show protect-switch configuration and status.

Example: Create protection pair E1-3 and E1-4, auto-switch mode is return mode, restore time is 5 minutes; force protection pair works on protection channel, clear force command and delete protection pair:

Raisecom# **config**

Configuration mode, one conmmand input per time. End with CTRL-Z.

Raisecom(config)# **slot** *4*

Raisecom(config-slot/4)# **protect-switch** *enable 3/4*

Set successfully

Raisecom(config-slot/4)# **show aps**

```
----------------------------------------------------------------
  psId   exist   workLine   protectLine   activeLine   swStatus
  1      no      1          2             working      aps-switch

  Aps-revertive-mode   revertive-time-left   Aps-e3-sf
     12(m)                  0(s)                disable
----------------------------------------------------------------
  psId   exist   workLine   protectLine   activeLine   swStatus
  2      yes     3          4             working      aps-switch

  Aps-revertive-mode   revertive-time-left   Aps-e3-sf
     12(m)                  0(s)                disable
```

Raisecom(config-slot/4)# **aps-mode** *3/4* **revertive**

Set successfully

Raisecom(config-slot/4)# **aps-restore-time** *3/4 5*

Set successfully

Raisecom(config-slot/4)# **show aps**

```
-----------------------------------------------------------------
  psId    exist    workLine    protectLine    activeLine    swStatus
  1       no       1           2              working       aps-switch

  Aps-revertive-mode    revertive-time-left    Aps-e3-sf
    12(m)                 0(s)                   disable
-----------------------------------------------------------------
  psId    exist    workLine    protectLine    activeLine    swStatus
  2       yes      3           4              working       aps-switch

  Aps-revertive-mode    revertive-time-left    Aps-e3-sf
   5(m)                  0(s)                   6(s)
```

Raisecom(config-slot/4)# **force-switch** *3/4* **protection-line**

Set Successfully

Raisecom(config-slot/4)# **show aps**

```
-----------------------------------------------------------------
  psId    exist    workLine    protectLine    activeLine    swStatus
  1       no       1           2              working       aps-switch

  Aps-revertive-mode    revertive-time-left    Aps-e3-sf
   12(m)                 0(s)                   disable
-----------------------------------------------------------------
  psId    exist    workLine    protectLine    activeLine    swStatus
  2       yes      3           4              protection    force-switch

  Aps-revertive-mode    revertive-time-left    Aps-e3-sf
   5(m)                  0(s)                   disable
```

Raisecom(config-slot/4)# **force-switch** *3/4* **clear**

Set Successfully

Raisecom(config-slot/4)# **show aps**

```
-----------------------------------------------------------------
  psId    exist    workLine    protectLine    activeLine    swStatus
  1       no       1           2              working       aps-switch
  Aps-revertive-mode    revertive-time-left    Aps-e3-sf
  12(m)                 0(s)                   disable
-----------------------------------------------------------------
  psId    exist    workLine    protectLine    activeLine    swStatus
  2       yes      3           4              working       aps-switch
  Aps-revertive-mode    revertive-time-left    Aps-e3-sf
 5(m)                  0(s)                   disable
```

Raisecom(config-slot/4)# **protect-switch** *disable 3/4*

Set Successfully

Raisecom(config-slot/4)# **show aps**

```
------------------------------------------------------------------
  psId    exist    workLine    protectLine    activeLine    swStatus
  1       no       1           2              working       aps-switch

  Aps-revertive-mode    revertive-time-left    Aps-e3-sf
  12(m)                 0(s)                   disable
------------------------------------------------------------------
  psId    exist    workLine    protectLine    activeLine    swStatus
  2       no       3           4              working       aps-switch

  Aps-revertive-mode    revertive-time-left    Aps-e3-sf
  12(m)                 0(s)                   disable
```

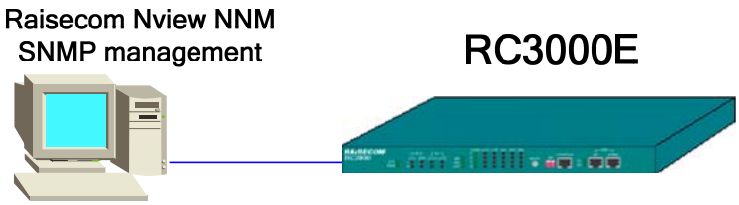
Chapter 8 Typical Application of Network Management Configuration

8.1 Overview

Subscribers can manage device by network management software besides hyper terminal. Management by software is much more systematically and with telnet, etc. advantages.

To access local device by network management software on PC, subscribers need to configure network IP, COMMUNITY, trap-server correct via hyper terminal on local DXC card, then it is able to realize successful access.

8.2 Local management configuration application



To manage local device, not only need connect PC with CONSOLE port of main card, but also should configure hyper terminal as below:

Step 1: Modify network management interface IP by command **ip address**, ensure the IP is in the same segment with PC. Suppose PC IP is 192.168.4.97:

Raisecom# **config**

Configuration mode, one conmmand input per time. End with CTRL-Z.

Raisecom(config)# **interface snmp**

Raisecom(config-snmp)# **ip address** *192.168.4.28*

Set successfully

Raisecom(config-snmp)# **show interface snmp**

Interface:snmp

Administration Status : up Operation Status : down

Description: snmp

Internet address: 192.168.4.28 Netmask: 255.255.255.0

Ethernet address: 00:00:01:02:03:04

Duplex:half-duplex Speed:10baseT

Autonegotiation:enable

Step 2: Configure COMMUNITY:

Raisecom(config)# **snmp-server community** *public ro*

Set snmp community name successfully

Raisecom(config)# **snmp-server community** *private rw*

Set snmp community name successfully

Raisecom(config)# **show snmp-server community**

ID COMMUNITYNAME RIGHT

---

1 public ro

2 private rw

Step 3: Set trap-server host:

Raisecom(config)# **snmp trap-server** *192.168.4.97*

Set trap server successfully

Raisecom(config)# **show snmp trap-server**

Trap server:

ADDRESS PORT

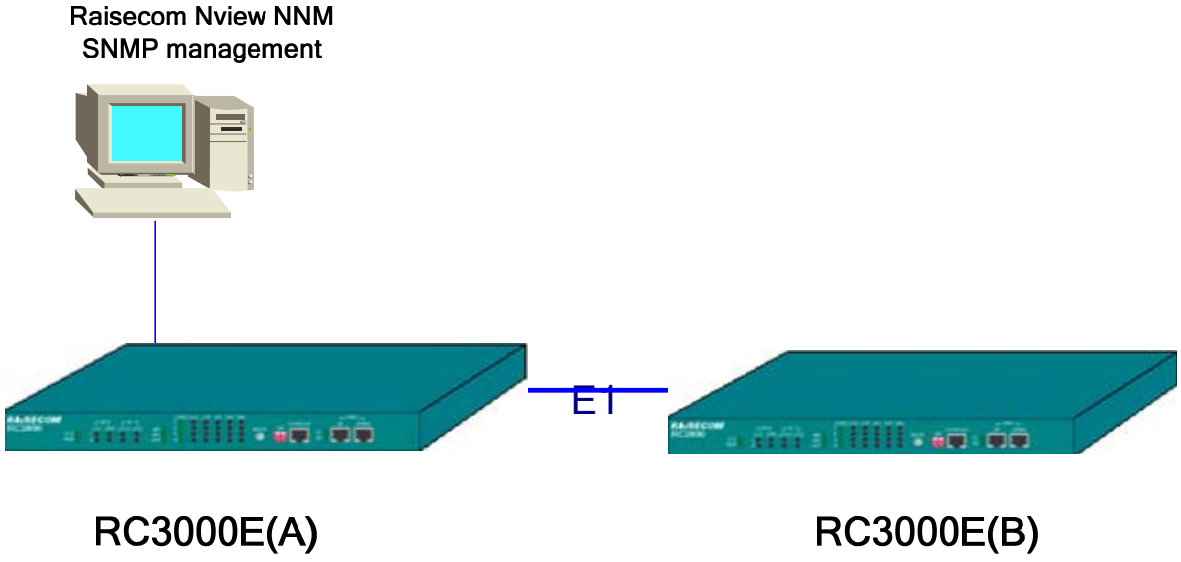
192.168.4.97 162

8.3 Point-to-Point remote network management application

Commands	Description
config	Enter into global configuration mode.
system-management-mode *(master|slave)*	Configure device master/slave mode, it is slave mode by default. *master*: master mode; *slave*: slave mode.
system-management-port e1 *<1-8>* **system-management-port optical**	Choose network channel under management in slave mode. *E1*: to manage through E1 network management channel; *1-8:* main card E1 interface ID; **optical***:* to manage through optical interface network management channel.
nms-channel-select e1 *<1-8> (sa4-channel| sa5-channel)*	Set network management selection for E1 management channel.
nms-channel-select e1 *<1-8>* **alone-timeslot** *<1-31>*	*1-8:* main card E1 interface ID; *sa4-channel*: use SA4 management channel *sa5-channel*: use SA5 management channel *alone-timeslot*: use independent timeslot management channel *<1-31>*: independent timeslot selection
sub-device-baud e1 *<1-8> (2400|9600)*	Set baud rate for E1 management channel in master mode.

	<1-8>: main card E1 interface ID;
	2400: baud rate
	9600: baud rate
sub-device-add id *<1-200>* **e1** *<1-8>*	Add sub-device in master mode.
	1-200: device ID
	1-8: main card E1 interface ID;
	Use command **sub-device-del id** *<1-200>* to delete sub-device.
Device id *<1-200>*	Set device ID
	1-200: device ID
device baud *(2400|9600)*	Set device baud rate.
	2400: baud rate
	9600: baud rate
nms-bypass e1 *<1-8> (enable|disable)*	Enable/disable E1 management channel bypass.
	1-8: main card E1 interface ID;
	enable: enable bypass management channel;
	disable: disable bypass management channel.
show system-management	Show system management information.
Show device-nms	Show device management information.

The network topology shows as below figure. 2 sets of RC3000E, one service card with 8E1 (take RC3000E-UP-8E1-BL for example), connect PC to SNMP interface of device A main card:

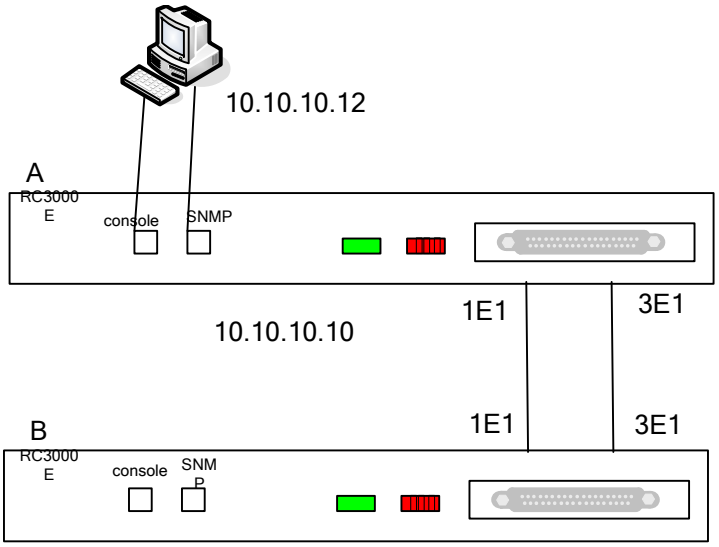


Configuring as following below steps:

Step 1: Configure local management for device A, device A is the master device, add remote device with ID 15 on E1-1;

Step 2: Configure local management for device B, device B is the slave device and the device ID is 15, which can be managed through E1-1;

Step 3: Network topology:



NOTE: If there are several E1 connection and no alarm between device A and B, user needs bypassing other E1 management channel of slave device to make sure the slave device be managed through the one and only network management interface, except protection pair and uplink interface. For example, device A and device B connected by E1-3, bypassing E1-3 of device B.

NOTE: Please save configuration and reboot device if device master/slave mode has been changed.

Create VCC link in device A and cross connect to optical port 1 E1 line 1 of 120x2-OPT card. Create similar VCC link in device B and cross connect to optical port 1 E1 line 1 of 120x2-OPT card. Connect device A and B by fibers. Configure gateway as 192.168.4.28. Suppose 120x2-OPT card is located in slot 1:

- Device A reference configuration commands (master device), as below:

Raisecom# **config**

Raisecom (config)# **system-management-mode** *master*

Raisecom (config)# **sub-device-add id** *15* **e1** *1*

Raisecom (config)# **nms-channel-select e1** *1 sa4-channel*

Raisecom (config)# **show system-management**

Raisecom (config)# **sub-device-baud e1** *1 2400*

Execute the following command if user wants to change device master/slave control mode:

Raisecom #**write**

Raisecom#**reboot**

- Device B reference configuration commands (slave device), as below:

Raisecom# **config**

Raisecom (config)# **system-management-mode** *slave*

Raisecom (config)# **system-management-port** *e1 1*

Raisecom (config)# **nms-channel-select e1** *1 sa4-channel*

Raisecom (config)# **nms-bypass e1** *3 enable*

Raisecom (config)# **show system-management**

Raisecom (config)#**device id** *15*

Raisecom (config)# **device baud** *2400*

Raisecom (config)#**show device-nms**

Execute the following command if user wants to change device master/slave control mode:

Raisecom # **write**

Raisecom# **reboot**

After successful configuration, device A can manage device.

8.4 Remote device cascade network management application

4 sets of RC3000E devices cascade to build remote device cascade application, the topology shows as below:

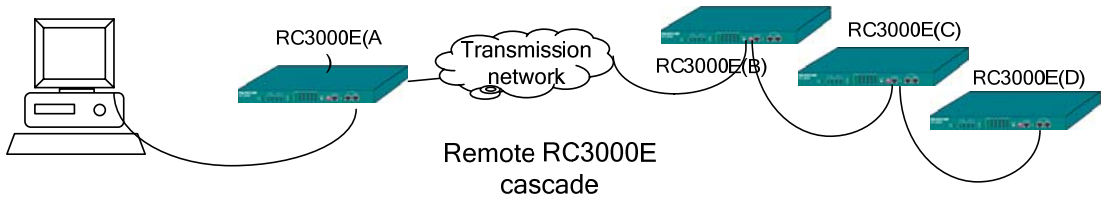


Figure 8-4 Ring network remote management topology

Configuration procedure:

Step 1: Configure local management for device A.

Step 2: Set device A in master mode, add remote devices with ID 15, 16, 17 on E1-1.

Step 3: Configure local management for device B, C and D, the three devices are all in slave mode, with device ID 15, 16, 17, down-connect to device C via E1-3 and managed through E1-1.

Step 4: The network connection shows as below figure.

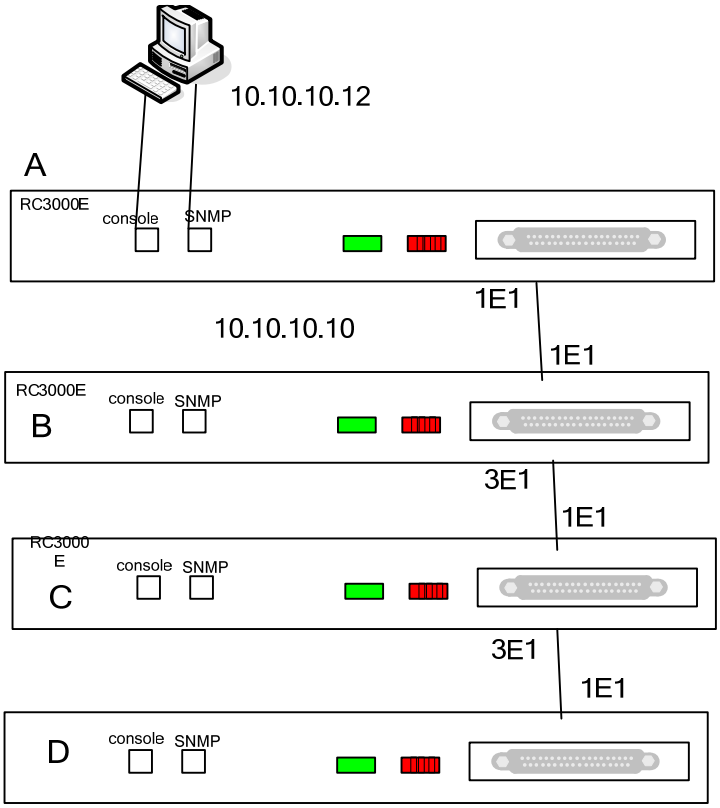


Figure 8-5 Cascade network building topology

NOTE: If there are several E1 connection and no alarm between RC3000E devices, user needs bypassing other E1 management channel of slave device to make sure the slave device be managed through the one and only network management interface, except protection pair and uplink interface.

- Device A reference configuration commands (master device), as below:

Raisecom# **config**

Raisecom (config)# **system-management-mode** *master*

Raisecom (config)# **sub-device-add id** *15* **e1** *1*

Raisecom (config)# **sub-device-add id** *16* **e1** *1*

Raisecom (config)# **sub-device-add id** *17* **e1** *1*

Raisecom (config)# **nms-channel-select e1** *1 sa4-channel*

Raisecom (config)# **show system-management**

Raisecom (config)# **sub-device-baud e1** *1 2400*

Execute the following command if user wants to change device master/slave control mode:

Raisecom #**write**

Raisecom#**reboot**

- Device B, C, D reference configuration commands (slave device), as below:

Raisecom# **config**

Raisecom (config)# **system-management-mode** *slave*

Raisecom (config)# **system-management-port e1** *1*

Raisecom (config)# **nms-channel-select e1** *1 sa4-channel*

Raisecom (config)# **nms-channel-select e1** *3 sa4-channel*

Raisecom (config)# **nms-bypass e1** *2 enable*

Raisecom (config)# **nms-bypass e1** *4 enable*

Raisecom (config)# **nms-bypass e1** *5 enable*

Raisecom (config)# **nms-bypass e1** *6 enable*

Raisecom (config)# **nms-bypass e1** *7 enable*

Raisecom (config)# **nms-bypass e1** *8 enable*

Raisecom (config)# **show system-management**

Raisecom (config)#**device id** *15* (set device C as 16, device D as 17)

Raisecom (config)# **device baud** *2400*

Raisecom (config)#**show device-nms**

Execute the following command if user wants to change device master/slave control mode:

Raisecom # **write**

Raisecom# **reboot**

After successful configuration, device A can manage device B, C and D.

8.5 SA data transparent transmission management application

Device A can manage device C via RC3000E-B, which building RC3000E SA data transparent transmission. Device A can be RC3000-15+8E1, RC3000E or device from other vendors, device C can be RC3000E, RC3000, RC3101 or device from other vendors.

Example: Device A is RC3000E-A, device B is RC3000E-B, device C is RC3000E-C, the topology of devices shows as below:

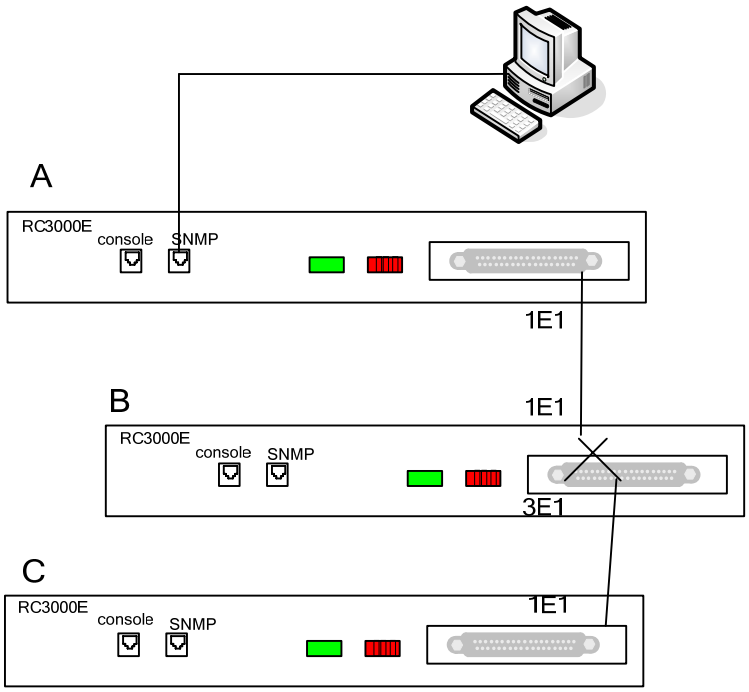


Figure 8-6 Ring network remote management topology

The configuration procedure:

Step 1: Configure local management for device A.

Step 2: Set device A in master mode, add remote device with ID 15 on E1-1.

Step 3: Set device B in slave mode, with device ID 10, down-connect to device C via E1-3.

Step 4: Set device C in slave mode, with device ID 15.

- Device A reference configuration commands (slave device), as below:

Raisecom# **config**

Raisecom (config)# **system-management-mode** *master*

Raisecom (config)# **sub-device-add id** *15* **e1** *1*

Raisecom (config)# **nms-channel-select e1** *1 sa4-channel*

Raisecom (config)# **show system-management**

Raisecom (config)# **sub-device-baud e1** *1 2400*

Execute the following command if user wants to change device master/slave control mode:

Raisecom #**write**

Raisecom#**reboot**

- Device B reference configuration commands (slave device), as below:

Raisecom# **config**

Raisecom (config)# **system-management-mode** *slave*

Raisecom (config)# **nms-channel-select e1** *1 sa4-channel*

Raisecom (config)# **nms-channel-select e1** *3 sa4-channel*

Raisecom (config)# **nms-bypass e1** *1 enable*

Raisecom (config)# **nms-bypass e1** *3 enable*

Raisecom (config)# **show system-management**

Raisecom (config)#**device id** *10*

Raisecom (config)# **device baud** *2400*

Raisecom (config)#**show device-nms**

Raisecom (config)# **crossconnect source** *4/1/0* **sink** *4/3/0* **twoway**

Execute the following command if user wants to change device master/slave control mode:

Raisecom # **write**

Raisecom# **reboot**

- Device C reference configuration commands (slave device), as below:

Raisecom# **config**

Raisecom (config)# **system-management-mode** *slave*

Raisecom (config)# **nms-channel-select e1** *1 sa4-channel*

Raisecom (config)# **show system-management**

Raisecom (config)#**device id** *15*

Raisecom (config)# **device baud** *2400*

Raisecom (config)#**show device-nms**

Execute the following command if user wants to change device master/slave control mode:

Raisecom # **write**

Raisecom# **reboot**

After successful configuration, device A can manage device C but can not manage device B.

Appendix A Acronyms

Acronyms	Full-spelling
ADM	Add-Drop Multiplexer
AIS	Alarm Indication Signal
APS	Automatic Protection Switching
AU	Administrative Unit
AU-n	Administration Unit，level n
AUG	Administration Unit Group
AU-PTR	Administration Unit Pointer
BBE	Background Block Error
BBER	Background Block Error Ratio
BER	Bit Error Ratio
CMI	Coded Mark Inversion
C-n	Container- n
CORBA	Common Object Request Broker Architecture
CV	Code Violation
DCC	Data Communications Channel
DCE	Data Circuit-terminating Equipment
DCF	Data Communications Function
DCN	Data Communications Network
DDN	Digital Data Network
DTE	Data Terminal Equipment
DXC	Digital Cross Connect
ECC	Embedded Control Channel
EM	Element Management
EML	Element Management Layer
EMS	Element Management System
EOS	Ethernet Over SDH
ES	Error Second
ESR	Error Second Ratio
ETSI	European Telecommunication Standards Institute
FEBBE	Far End Background Block Error
FEES	Far End Error Second
FESES	Far End Severely Error Second
GUI	Graphical User Interface

HDLC	High Digital Link Control
HPC	Higher order Path Connection
IP	Internet Protocol
ITU-T	International Telecommunication Union-Telecommunication Standardization Sector
L2	Layer 2
LAN	Local Area Network
LCT	Local Craft Terminal
LOF	Loss Of Frame
LOP	Loss Of Pointer
LOS	Loss Of Signal
LPC	Lower order Path Connection
MAC	Medium Access Control
MAN	Metropolitan Area Network
MCU	Micro Control Unit
MD	Mediation Device
MF	Mediation Function
MII	Medium Independent Interface
MM	Multi Mode
MS	Multiplex Section
MS-AIS	Multiplex Sections - Alarm Indication Signal
MSOH	Multiplex Section OverHead
MSP	Multiplex Section Protection
NE	Network Element
NEF	Network Element Function
NEL	Network Element Layer
NML	Network Manager Layer
NMS	Network Management System
OAM	Operation,Administration and Maintenance
OFS	Out of Frame Second
OOF	Out of Frame
OS	Operation System
OSI	Open System Interconnect
PCM	Pulse Code Modulation
PDH	Plesiochronous Digital Hierarchy
PJE+	Pointer Justification Event +
PJE-	Pointer Justification Event -
POH	Path OverHead

PPP	Point to Point Protocol
PRC	Primary Reference Clock
RAM	Random Access Memory
RDI	Remote Defect Indication
REI	Remote Error Indication
REG	Regenerator
RFI	Remote Failure Indication
RIP	Router Information Protocol
RMII	Reduced Medium Independent Interface
RS	Regenerator Section
RSOH	Regenerator Section OverHead
SDH	Synchronous Digital Hierarchy
SEC	SDH Equipment Clock
SES	Severely Error Second
SESR	Severely Error Second Ratio
SETS	Synchronous Equipment Timing Source
SM	Single Mode
SNCP	Sub network Connection Protection
SOH	Section Overhead
SPRING	Shared Protection Ring
SSM	Synchronous State Message
STM-N	Synchronous Transport Module Level-N
TCP	Transport Control Protocol
TDEV	Time Deviation
TDM	Time Division Multiplex
TM	Terminal Multiplexer
TMN	Telecommunications Management Network
TU	Tributary Unit
TU-m	Tributary Unit，level m
TUG-m	Tributary Unit Group, level m
UAS	Unavailable Second
VC	Virtual Container
VC-n	Virtual Container, level n
VLAN	Virtual Local Area Network
WAN	Wide Area Network

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